

ENVIRONMENTAL CONSULTING & MANAGEMENT
ROUX ASSOCIATES INC

Rec. 9-21-05



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September 16, 2005

Victoria E. Ioff
Remedial Project Manager
United States Environmental Protection Agency
Region III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

Re: NGK Site Work Plan

Dear Victoria:

On behalf of NGK Metals, Inc., Roux Associates, Inc. is pleased to submit 3 copies of the document entitled, "Work Plan for Assessing Groundwater Conditions in the Vicinity of the NGK Metals Site, Reading, Pennsylvania". The document incorporates the changes requested in your letter of August 3, 2005.

I spoke with Joel Hennessey, and he indicated that he will review the document on September 26, upon his return from vacation. We also agreed that if he has no other comments, we do not need to meet on September 28, as now planned.

I look forward to moving ahead on the project, and appreciate your help, as always.

Sincerely,

A handwritten signature in black ink, appearing to read "M. A. Hewitt", with a large checkmark at the end.

Marilyn A. Hewitt, P.G.
Principal Geologist

cc: Lynne Woodside
NGK Metals Corporation
917 US Highway 11 South
Sweetwater, TN 37874

Rec. 9-21-05
V. J. [Signature]

September 16, 2005

Work Plan For Assessing Groundwater Conditions In The Vicinity Of The NGK Metals Site

**NGK Metals
Reading, Pennsylvania**

Prepared for

**NGK Metals Corporation
917 US Highway 11 South
Sweetwater, TN 37874**

ROUX ASSOCIATES, INC.
Environmental Consulting & Management



1222 Forest Parkway, Suite 190, West Deptford, New Jersey 08066

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FIGURES

1. Site Location Map
2. Fracture Trace Analysis and Proposed Monitoring Well Locations



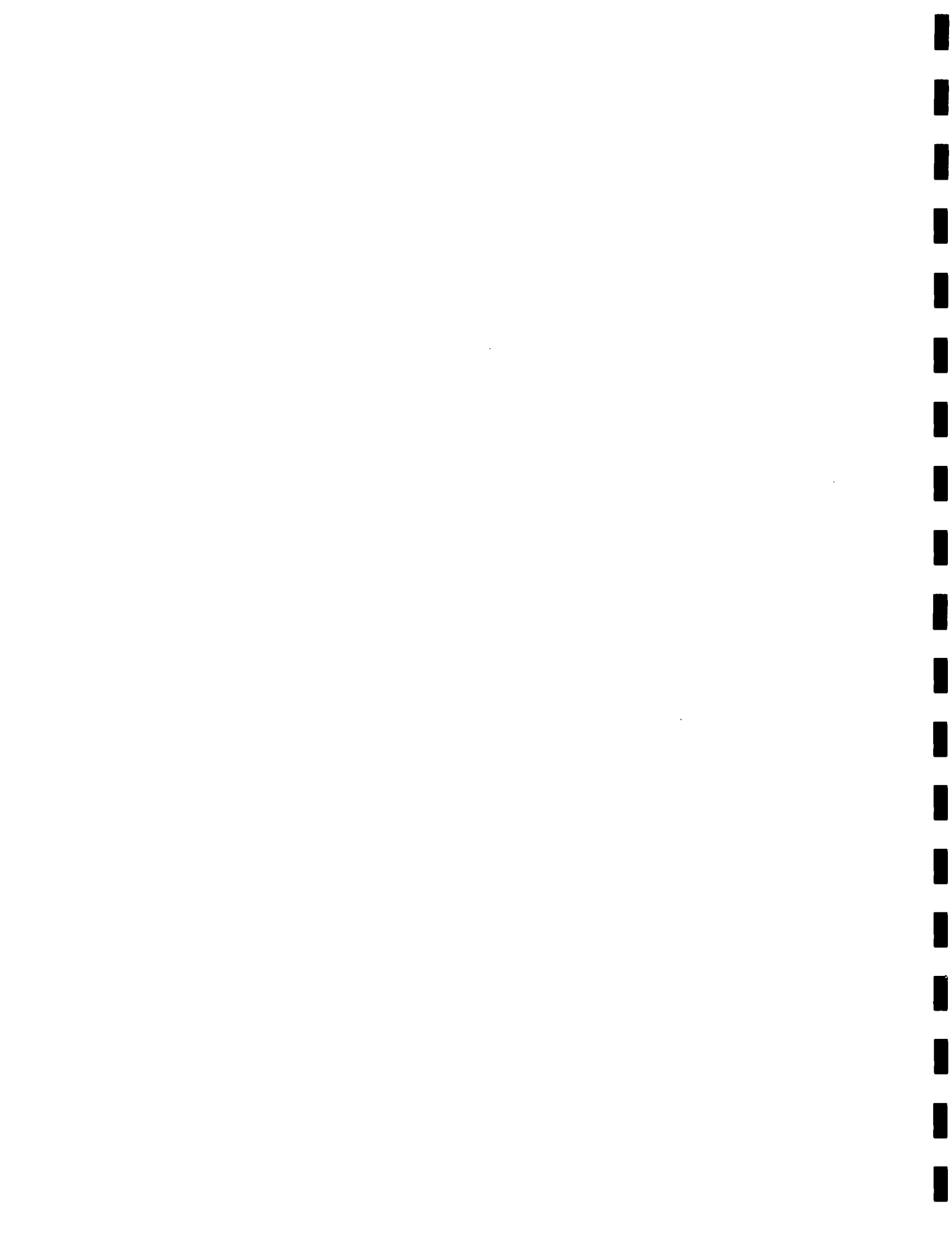
1.0 INTRODUCTION

Roux Associates, Inc. has prepared this scope of work for evaluating the effectiveness of the groundwater remedy at the NGK Metals site, located in Muhlenberg Township, Berks County, Pennsylvania. The NGK site, a former manufacturing facility that ceased operations over 4 years ago, is undergoing Resource Conservation and Recovery Act Corrective Action (RCRA CA).

Figure 1 is a site location map. Historically, the NGK facility extracted beryllium from imported ores. The process resulted in waste material called "red mud", which was deposited in disposal areas on the property until the mid 1960s. The disposal areas and associated groundwater contamination were the principal subjects of RCRA CA investigations, and the 1994 Statement of Basis, resulting from those investigations, required NGK to properly close the disposal areas and extract and treat the groundwater beneath the site.

RCRA closure of the main disposal areas has been completed, and the remaining source areas are scheduled to be completed by June 30, 2005. At that time, all remedial actions required by the Statement of Basis for the source areas will have been completed.

The onsite groundwater is impacted by beryllium, chromium, and fluoride exceeding maximum contaminant levels (MCLs). The groundwater recovery system became operational in 2002. It removes metals from the extracted groundwater prior to discharge into Laurel Run. During the course of renewing the NPDES Permit for the groundwater extraction/treatment system, the Pennsylvania Department of Environmental Protection (PADEP) and the Muhlenberg Township Municipal Authority (MTA) commented that Laurel Run may be a losing stream, with the resultant effect that fluoride in the discharge may migrate into the aquifer and ultimately impact offsite groundwater.



2.0 REVIEW OF EXISTING DATA

2.1 Historical NGK Site Data

Historical groundwater data indicate that the limestone aquifer was impacted by offsite migration of fluoride, chromium, and beryllium originating at the facility disposal areas. Data from the 1980s showed groundwater impacts southwest of the site at MTA's Reading Crest Well, a residential well (called well OS-1), and Mammoth Spring, which discharges to Laurel Run near its confluence with the Schuylkill River. These locations are shown on Figure 1, extracted from the site RCRA Facility Investigation (Dunn Geoscience Corporation, October 25, 1991). Groundwater data collected from wells at both onsite and offsite locations from the late 1980s/early 1990s to the present are shown in Table 1 (prepared by GES).

The data indicate that although site-related constituents (SRCs) continue to impact the groundwater at the NGK site, offsite monitoring points no longer appear to be impacted, because natural attenuation processes and corrective actions may have reduced the levels of SRCs to below MCLs in the offsite areas. This lack of offsite impacts was evident even before the extraction/treatment system was installed at the site and is reflected in groundwater quality data from the MTA production wells in the vicinity of the site that MTA submitted in response to the USEPA's request.

2.2 Regional Hydrogeology

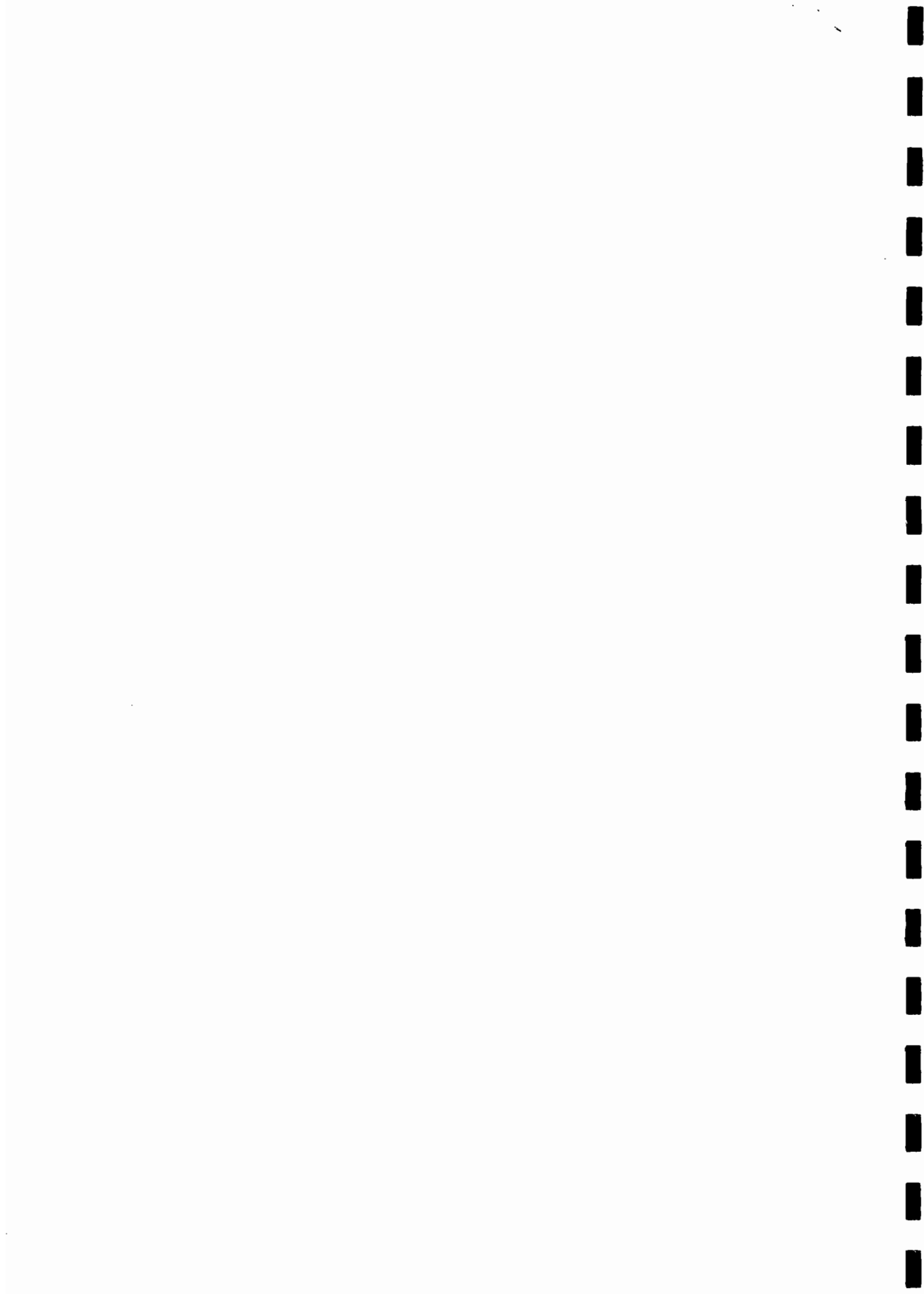
The area of interest is west-central portion of Muhlenberg Township, between Allentown Pike and the vicinity of Laurel Run, a tributary to the Schuylkill River. The limestone aquifer in the area of interest is the Allentown Fm., with the Tuckerton Member in the eastern portion of the area, and the Muhlenberg Member in the western portion. The aquifer is anisotropic, with preferential flow pathways along bedding planes, joints, fractures, and faults, some of which may have open conduit flow characteristics. To better understand the flow characteristics of the aquifer, anisotropy features have been evaluated, including:

- the strike and dip of the limestone units;
- regional fracture traces;
- regional potentiometric surface maps; and
- karst features such as springs, sinkholes, etc.



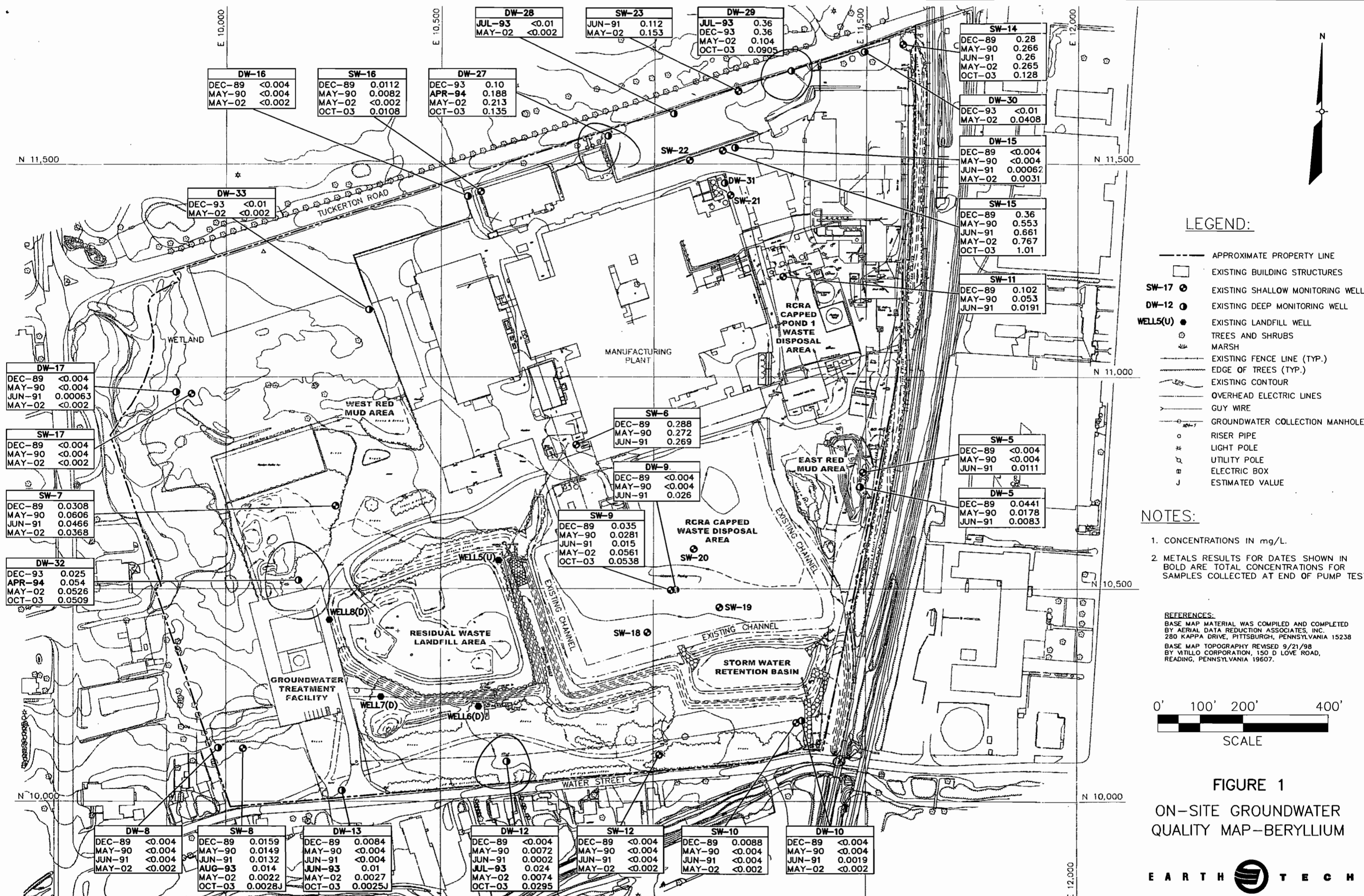
The regional structure of the area of interest is dominated by a broad anticline with a southward trending axis. Superimposed in the area of interest is a southward plunging anticline with its axis just west of Laurel Run, and a north plunging syncline to the east. Laurel Run appears to have developed along the contact between the Tuckerton Member and the less calcareous, more resistant Muhlenberg Member. Numerous smaller folds are superimposed, resulting in local changes of bedding attitude over short distances.

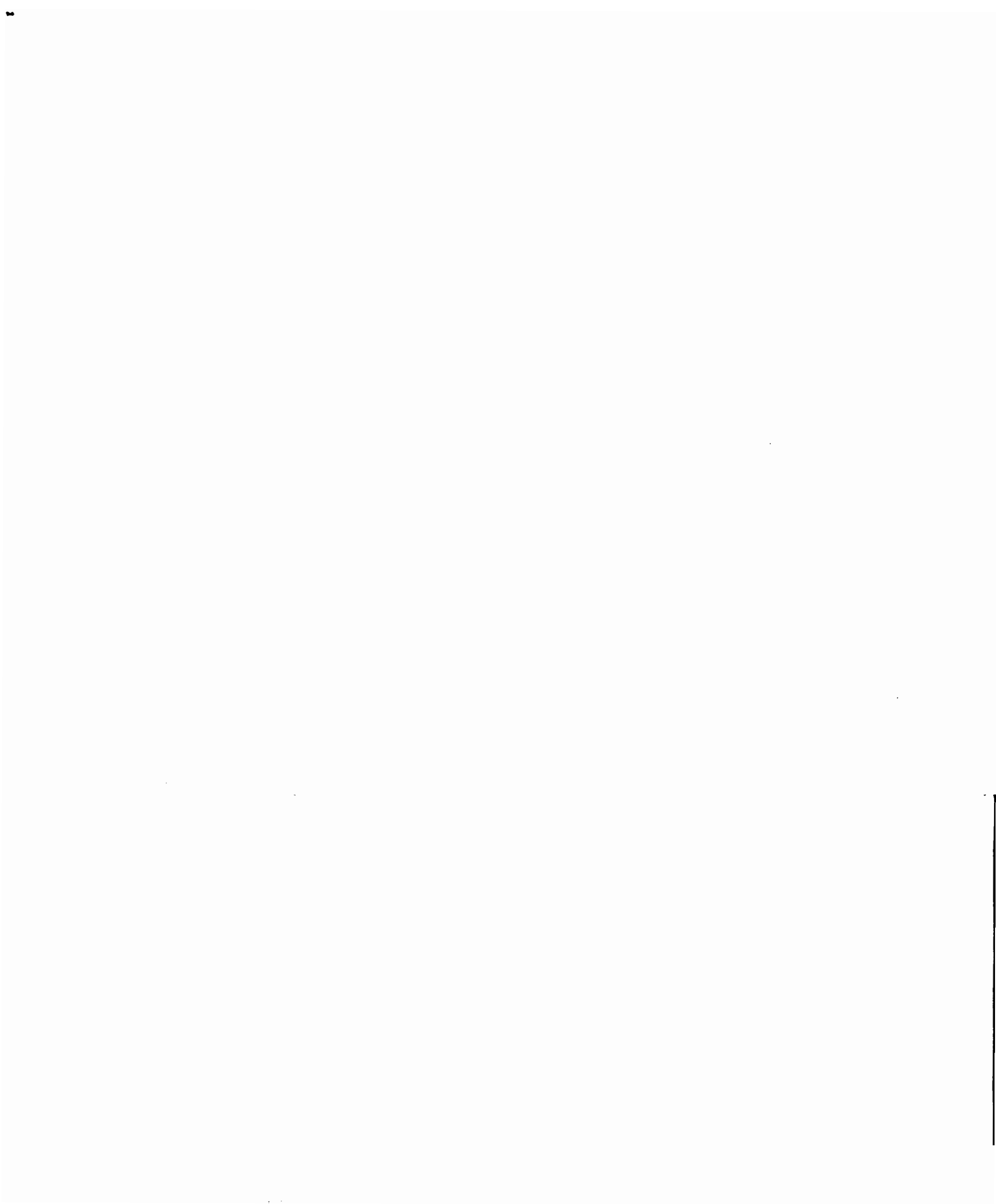
Figure 2 shows the results of a fracture trace analysis conducted using historical aerial photographs of the area obtained from the Pennsylvania Topographic and Geologic Survey. Stereo pairs from 1947, 1964, and 1968 were examined to identify linear patterns and sinkholes that appear to be related to bedrock fractures. These photographs will be scanned and transmitted electronically to USEPA Region III. The areas north-northeast and south of the NGK plant were mostly obscured by development, making the analysis difficult in those areas. However, it can be seen that there is a major fracture set that trends north-northeast throughout the area, and a secondary set that trends approximately northwest. The pathway of Laurel Run appears to be partly controlled by the contact between the Muhlenberg and Tuckerton members, and partly by bedrock fractures.

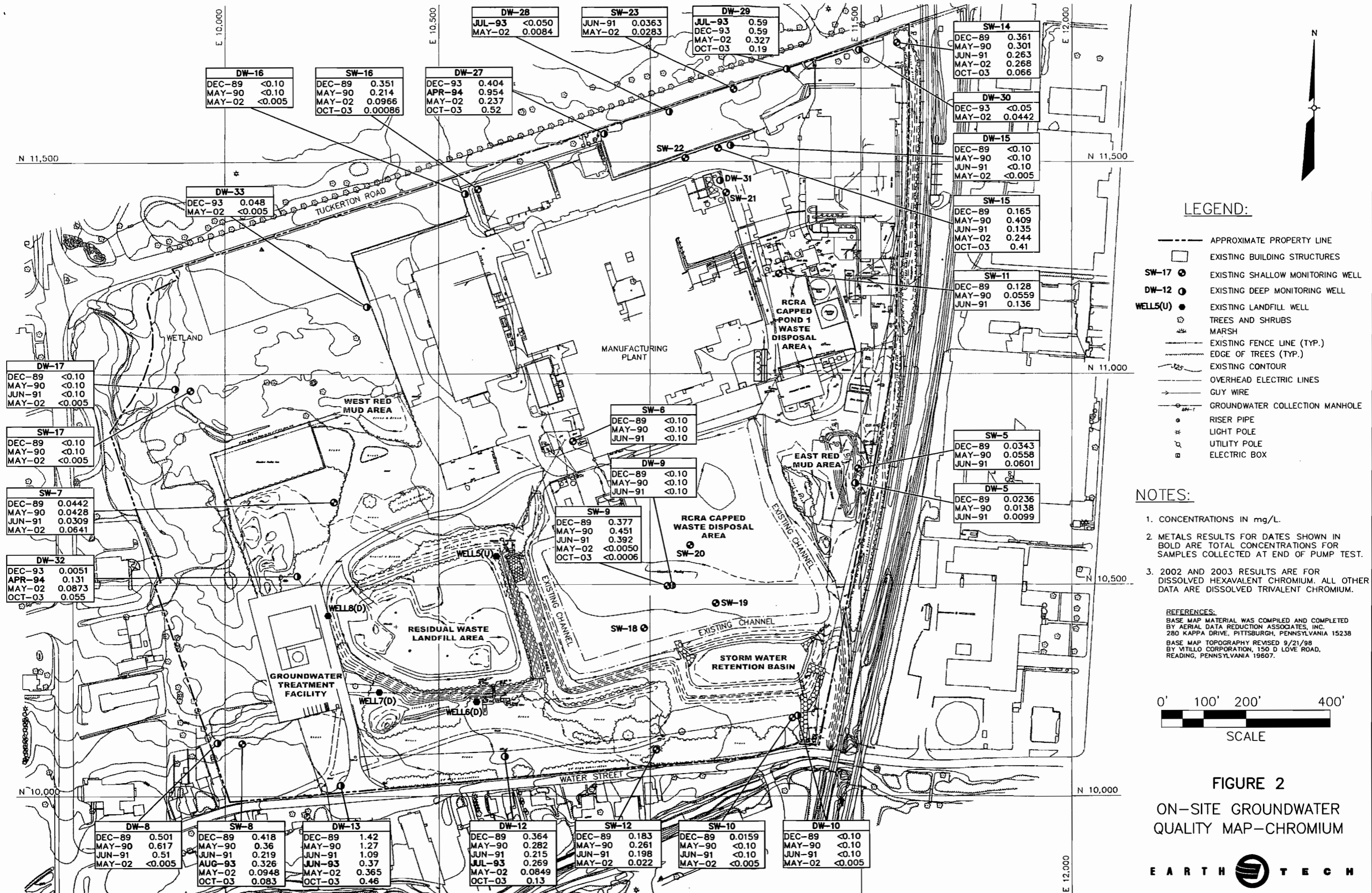


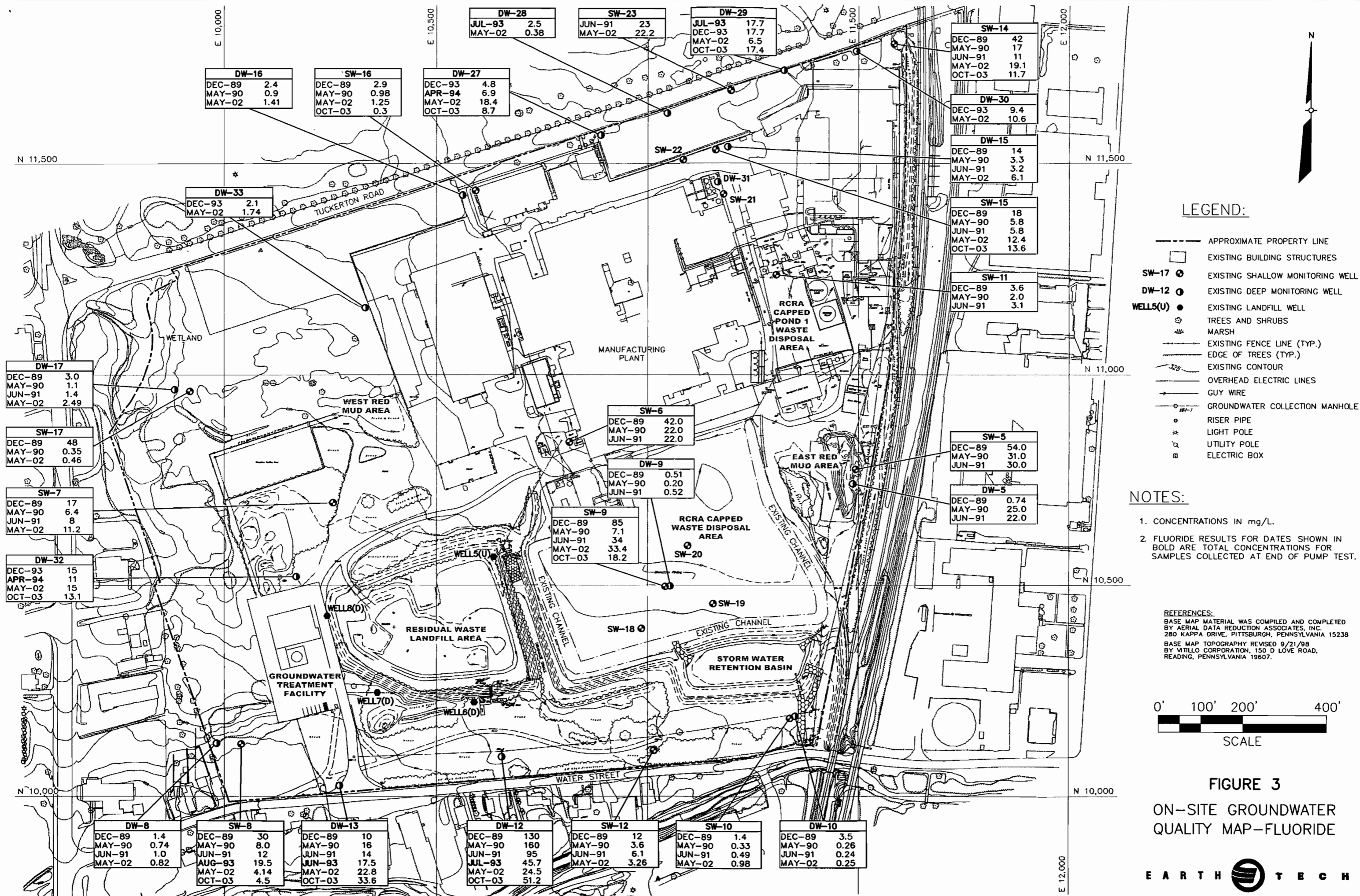
JULY 7, 2004

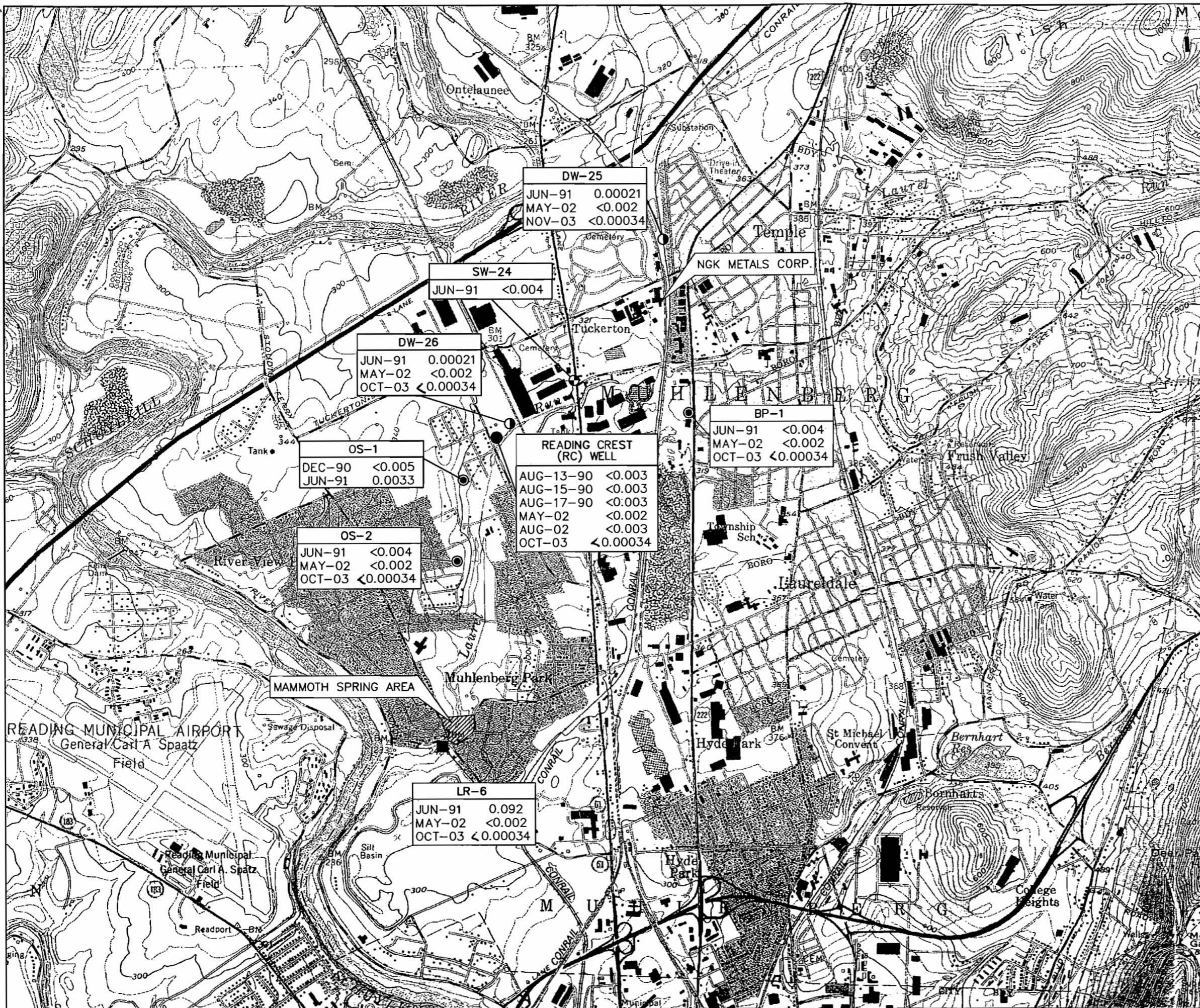
9413X001.DWG











LEGEND:

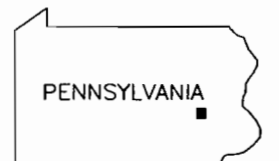
- SW-24 EXISTING SHALLOW MONITORING WELL
- DW-25 EXISTING DEEP MONITORING WELL
- RC MUNICIPAL WELL
- OS-1 SUPPLY WELL
- LR-6 SURFACE WATER/SEDIMENT SAMPLE LOCATION

NOTES:

1. CONCENTRATIONS IN mg/L.
2. OS-2 ANALYTICAL DATA FROM 1991 TO 2004 INDICATE THAT NO MCLs ARE EXCEEDED.

REFERENCES:

MAP DERIVED FROM U.S.G.S. 7.5 MINUTE TOPOGRAPHIC QUADRANGLE, TEMPLE, PA., DATED 1956, REVISED 1983, AND READING, PA., DATED 1956, REVISED 1983.

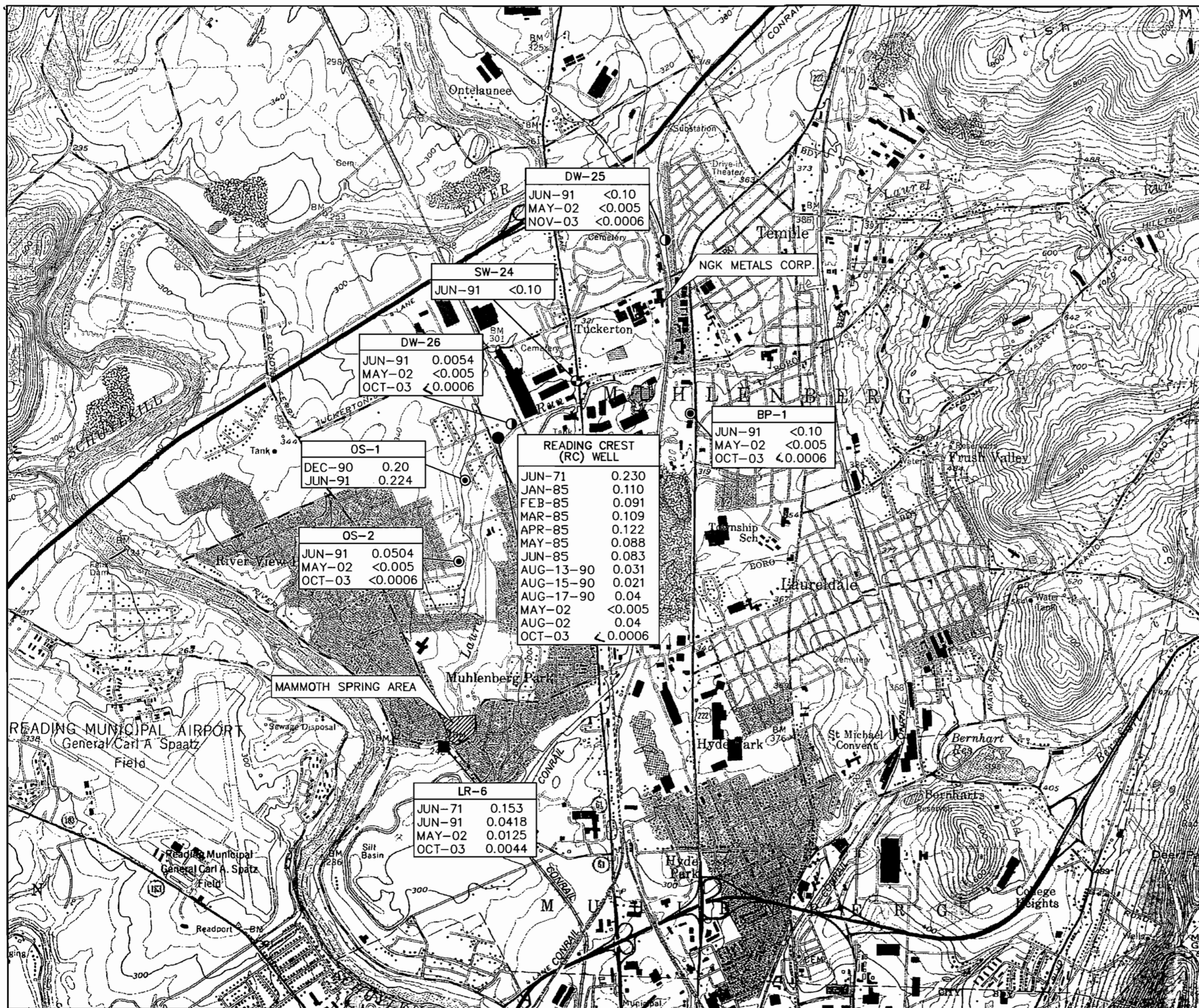


2000' 0 2000'
APPROX. SCALE IN FEET

FIGURE 4
OFF-SITE GROUNDWATER
QUALITY MAP-BERYLLIUM

JULY 7, 2004

9413X007.DWG



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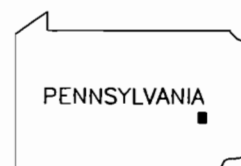
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- LR-6 SURFACE WATER/SEDIMENT SAMPLE LOCATION

NOTES:

1. CONCENTRATIONS IN mg/L.
2. OS-2 ANALYTICAL DATA FROM 1991 TO 2004 INDICATE THAT NO MCLs ARE EXCEEDED.
3. JANUARY 1985 THROUGH JUNE 1985, AND 2003 RESULTS ARE FOR DISSOLVED HEXAVALENT CHROMIUM. ALL OTHER DATA ARE DISSOLVED TRIVALENT CHROMIUM.

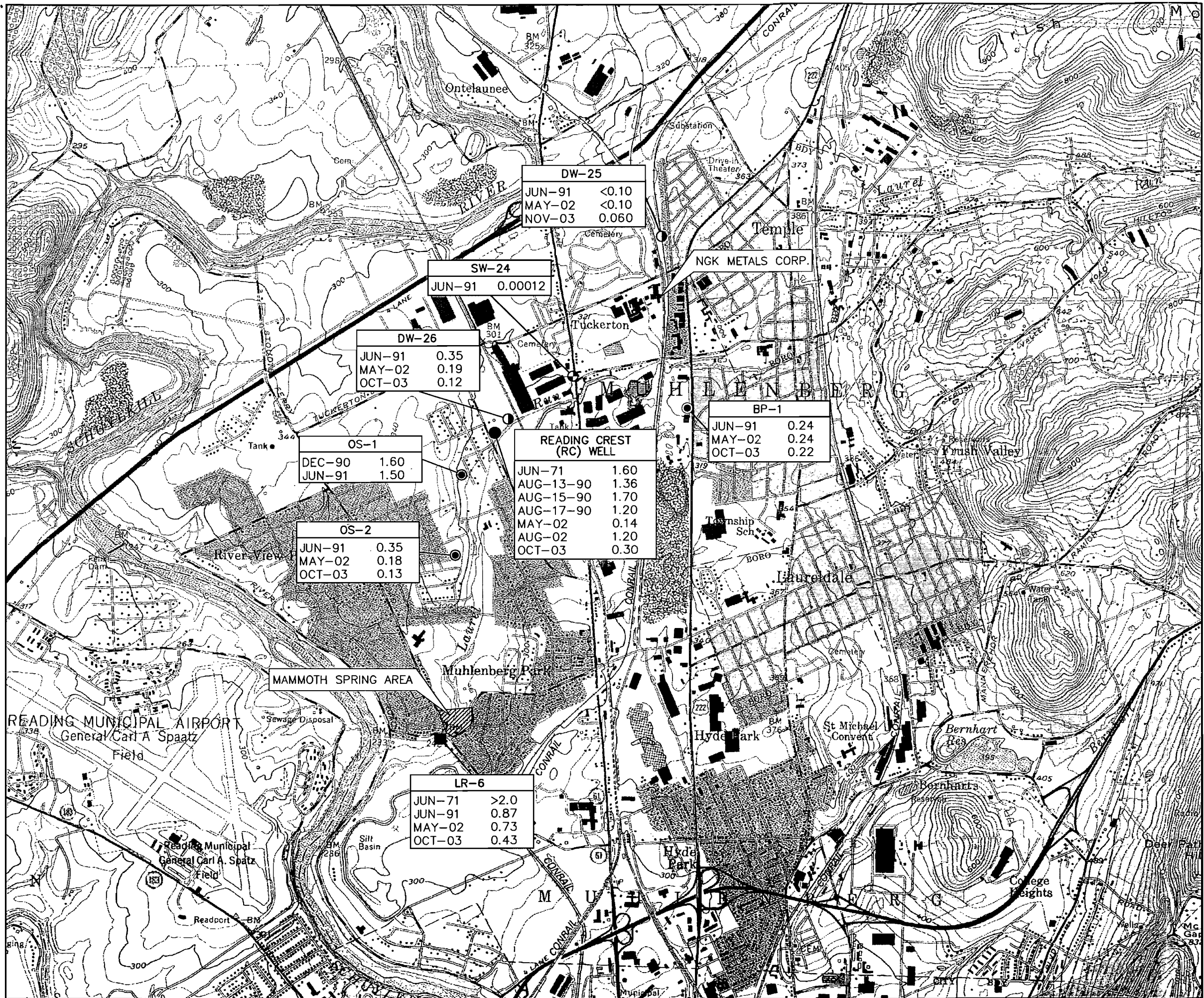
REFERENCES:

MAP DERIVED FROM U.S.G.S. 7.5 MINUTE TOPOGRAPHIC QUADRANGLE, TEMPLE, PA., DATED 1956, REVISED 1983, AND READING, PA., DATED 1956, REVISED 1983.



2000' 0 2000'
APPROX. SCALE IN FEET

FIGURE 5
OFF-SITE GROUNDWATER
QUALITY MAP-CHROMIUM



LEGEND:

- SW-24 EXISTING SHALLOW MONITORING WELL
- DW-25 EXISTING DEEP MONITORING WELL
- RC MUNICIPAL WELL
- OS-1 SUPPLY WELL
- LR-6 SURFACE WATER/SEDIMENT SAMPLE LOCATION

NOTES:

1. CONCENTRATIONS IN mg/L.
2. OS-2 ANALYTICAL DATA FROM 1991 TO 2004 INDICATE THAT NO MCLs ARE EXCEEDED.

REFERENCES:

MAP DERIVED FROM U.S.G.S. 7.5 MINUTE TOPOGRAPHIC QUADRANGLE, TEMPLE, PA., DATED 1956, REVISED 1983, AND READING, PA., DATED 1956, REVISED 1983.

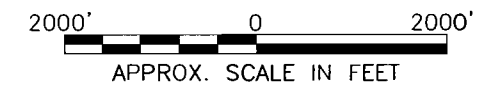


FIGURE 6
OFF-SITE GROUNDWATER
QUALITY MAP-FLUORIDE

3.0 PROJECT GOALS AND OBJECTIVES

Given the concerns of the MTA and PADEP regarding the potential impacts of the discharge from the extraction/treatment system on the aquifer and the existing data indicating an apparent abatement of the historical offsite groundwater impacts, the USEPA and NGK have agreed that further evaluation is necessary to determine whether continued operation of the groundwater extraction/treatment system is the most appropriate means to meet the requirements of the RCRA CA program and protect the existing and planned future uses of the aquifer. As the basis for that evaluation, additional monitoring and studies must be conducted to determine the following:

- the current extent of site-related constituents in on and offsite groundwater, when the groundwater recovery/treatment system is not operating;
- the current groundwater receptors related to aquifer usage and discharge areas downgradient of the NGK property;
- the degree to which existing MTA production wells may or may not impact migration of site-related constituents from the NGK property;
- the areal extent of the of the aquifer in which future groundwater usage might cause SRCs beneath the NGK property to migrate off site; and
- whether or not continued groundwater extraction/treatment is needed at the NGK property to protect the aquifer for current and future use by the MTA.

- a new monitoring well due south of the NGK property, on the south side of Laurel Run, between the stream and the abandoned quarry where a cave entrance was located historically. ✓

The new wells will be drilled to a depth of approximately 200 feet, using a six-inch diameter air hammer. The wells will be constructed using Continuous Multichannel Tubing® (CMT). The CMT is 1.6-inch diameter HDPE tubing divided into discrete channels. Each channel can be perforated and sand-packed/bentonite sealed at the desired depth interval for monitoring. The wells will be constructed to monitor shallow, intermediate, and deep zones in the aquifer. The zones to be monitored will be selected during drilling, on the basis of the occurrence of water bearing zones and relative water yields.

- Establish four surface water-monitoring locations in Laurel Run:
 - Adjacent to the new well to be located off the southern NGK property boundary;
 - Adjacent to the location of the Reading Crest well and NGK well MW-26;
 - Adjacent to the new well location that will replace OS-2;
 - In the Mammoth Spring discharge area.

The approximate locations are shown on Figure 2. Staff gauges will be installed at these locations, and surveyed to allow periodic measurement of Laurel Run surface water elevations.

Beginning two weeks after the installation of the new monitoring wells, NGK will conduct an initial monitoring event for the SRCs at:

- all onsite monitoring wells, with the exception of:
 - SW-20, because it is in close proximity to SW-9, which is currently used to monitor groundwater beneath the center of the RCRA Capped Waste Disposal Area, and
 - SW-21 and SW-22, because they are in close proximity to SW-15, which is currently used to monitor groundwater beneath the northwestern portion of the site.

OK

→ discussed
w/ EPA prior
to
on Saturday

- The new and replacement monitoring wells described above, existing residential well OS-2, MTA's Reading Crest Well, the former Berks Products production well, monitoring well MW-25, and wells MTA-3, 4, 12 and 13, all in the vicinity of the NGK site;
- any monitoring wells selected on the Berks Products and Muhlenberg Township Authority quarry properties; and
- Laurel Run at several locations in the area where groundwater from Mammoth Spring enters the stream.

NGK will prepare a technical memorandum on the findings of the initial sampling event and submit it to the USEPA. If the data from the first monitoring event are consistent with the MTA's historical data (i.e., if site-related constituents are not detected above MCLs at the MTA production wells), NGK will seek the USEPA's approval to shut down the groundwater extraction/treatment system in anticipation of a quarterly monitoring program to determine ambient on and offsite groundwater conditions. ✓

Prior to the groundwater extraction/treatment system shutdown, pressure transducers with dataloggers will be installed in several wells to be agreed upon by NGK and the USEPA. Water levels will be collected by the dataloggers every hour for two weeks. Then, the data will be downloaded and evaluated to determine if additional detailed water level measurements are needed using the dataloggers, and if so, at what time intervals.

After the groundwater extraction/treatment system is shut down, NGK will initiate a quarterly monitoring program at the monitoring network.

NGK will conduct a minimum of three additional quarters of monitoring for SRCs at all of the offsite wells, Laurel Run, the karst feature sampling locations, and at onsite wells closest to the northwest, southwest, and southeast (i.e., downgradient) property boundaries. Immediately preceding each sampling event, NGK will measure the groundwater elevations at all on- and offsite wells, to the extent feasible at each MTA production well, and at the Laurel Run staff



gauges. NGK will measure groundwater and Laurel Run elevations thereafter on a monthly basis for the duration of the groundwater monitoring.

The proposed monitoring of the regional aquifer and Laurel Run are expected to be sufficient to identify any significant offsite migration pathways for the NGK SRCs. Before fluoride levels in water were subject to regulatory scrutiny, it was frequently used as a tracer in hydrogeologic studies to determine aquifer flow pathways, as it is not attenuated in groundwater by mechanisms such as adsorption or biodegradation. Consequently, the fluoride beneath the site should serve as a good tracer for identifying groundwater flow pathways.

At the end of one year of monitoring, technical reports evaluating the results of the quarterly monitoring events will be prepared and submitted to the USEPA. The reports will include groundwater table/potentiometric surface maps, with the analytical results plotted on maps. The report will include recommendations, as appropriate. For example, additional monitoring may be recommended if necessary for a complete evaluation. Or, if existing offsite receptors are impacted, the groundwater extraction/treatment system may be restarted.

4.2 Task 2 – Assess Future Aquifer Protection

In this task, NGK will determine the potential for the existing MTA wells to be impacted by SRCs in the future and identify areas of the aquifer that can be used for future water supply development without risk from the NGK SRCs. The data from Tasks 1 and 2 will be used as a basis for evaluating the aquifer through:

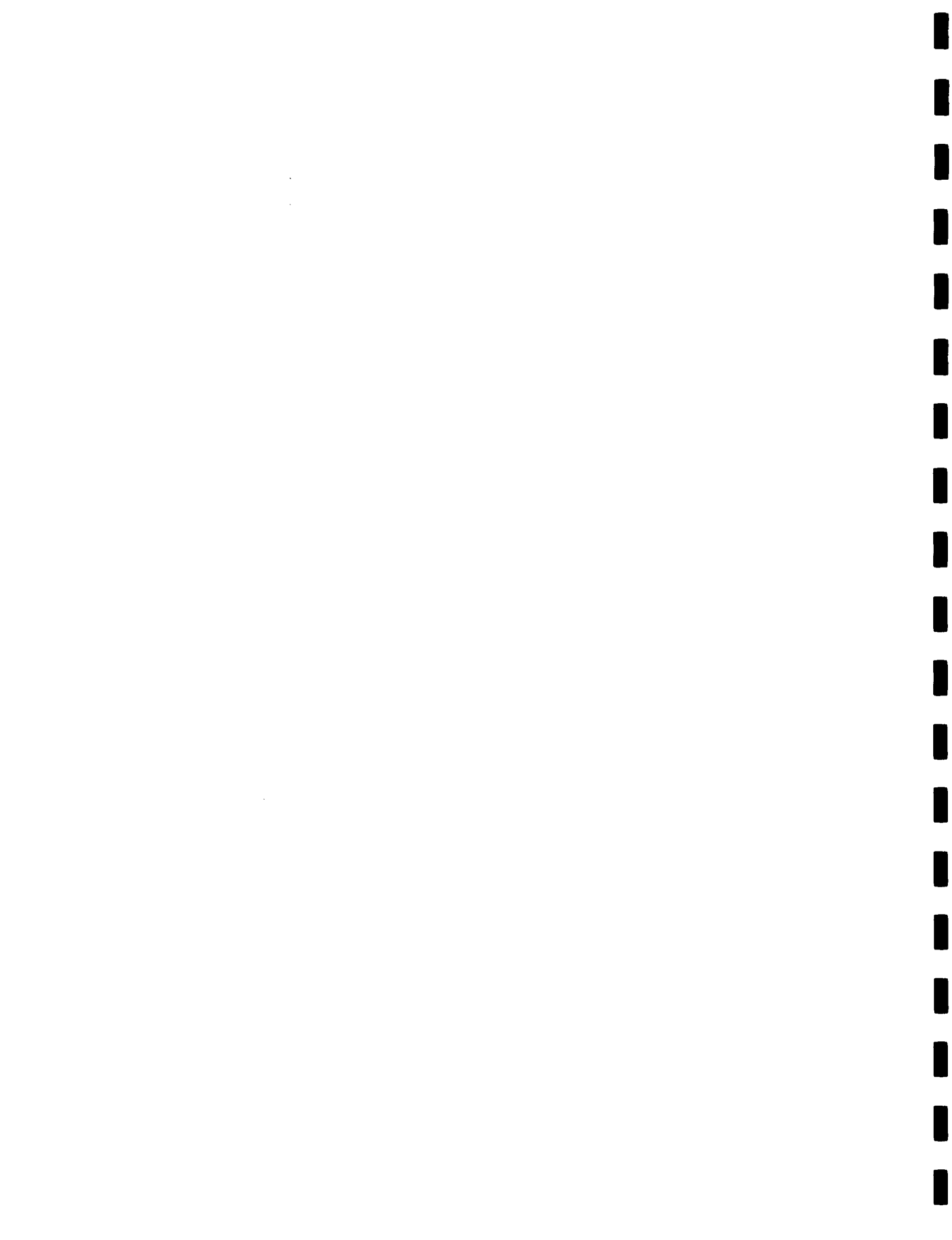
- construction of a conceptual model of anisotropic flow;
- construction of a regional computer model that takes into account the anisotropic features (The appropriate model to be used will be selected by NGK, USEPA, and the MTA, based on the nature of the aquifer);
- development of a model with various potential future water supply pumping scenarios, in cooperation with the MTA; and

Submit data
as received

- design of a sentinel groundwater monitoring program that will provide early warning of any change in the migration pattern of the NGK SRCs, with provisions for updating that program as necessary to protect future uses of the aquifer.

4.3 Task 3 – Final Report

After Tasks 1 and 2 have been completed, NGK will prepare a final report for submission to the USEPA. The report will include a comprehensive technical assessment of the findings of the aquifer evaluation, sampling events and groundwater modeling, and a fate and transport analysis for the SRCs. If appropriate, a risk assessment may be included. Based on the findings of each task, recommendations will be made for future actions related to the NGK site.





QUADRANGLE LOCATION

SOURCE

U.S.G.S. TEMPLE, PA (1999) AND READING, PA (1999)
7.5 MINUTES SERIES (TOPOGRAPHIC)

Title:

SITE LOCATION MAP

150 TUCKERTON ROAD
TEMPLE, PENNSYLVANIA

Prepared For:

NGK METALS CORP

ROUX

ROUX ASSOCIATES, INC.
Environmental Consulting
& Management

Compiled by: M.H.

Date: 6/14/05

FIGURE

Prepared by: B.F.

Scale: AS SHOWN

Project Mgr: M.H.

Office: NJ

File No: 13280101

Project: 132801J

1



LEGEND

- FRACTURE TRACE
- EXISTING OFF-SITE MONITORING WELL
- ▲ NEW MONITORING WELL
- MTA WELL #12
- X LAUREL RUN SAMPLING/STAFF GAUGE LOCATIONS

SOURCE

U.S.G.S. TEMPLE, PA (1999) AND READING, PA (1999)
7.5 MINUTES SERIES (TOPOGRAPHIC)

Title:

FRACTURE TRACE ANALYSIS AND PROPOSED NEW MONITORING WELL LOCATIONS

150 TUCKERTON ROAD
TEMPLE, PENNSYLVANIA

Prepared For:

NGK METALS CORP

ROUX

ROUX ASSOCIATES, INC.
Environmental Consulting
& Management

Compiled by: M.H.

Prepared by: PJT

Project Mgr: M.H.

File No: 13280102

Date: 09/15/05

Scale: AS SHOWN

Office: NJ

Project: 132801J

FIGURE

2

